



NASA Advisory Council Exploration Committee

**NAC Advisory Council, Public Meeting
August 4, 2011**

**Mr. Richard Kohrs
Chair
NAC Exploration Committee**



Exploration Committee Meeting

** Joint Meeting with Space Operations Committee*

NASA Ames Research Center

August 2 - 3, 2011



- **Mr. Bohdan Bejmuk, Co-Chair**
- **Ms. Nancy Ann Budden**
- **Mr. Joseph Cuzzupoli (via telecon)**
- **Ms. Carolyn Griner**
- **Mr. Richard Kohrs, Chair**
- **Dr. John M. Logsdon (via telecon)**
- **Dr. David Longnecker**
- **Gen. Lester Lyles (absent)**
- **Mr. Richard Malow (absent)**
- **Dr. Bette Siegel, Executive Secretary**
- **Ms. Shawanda Robinson, Administrative Officer**

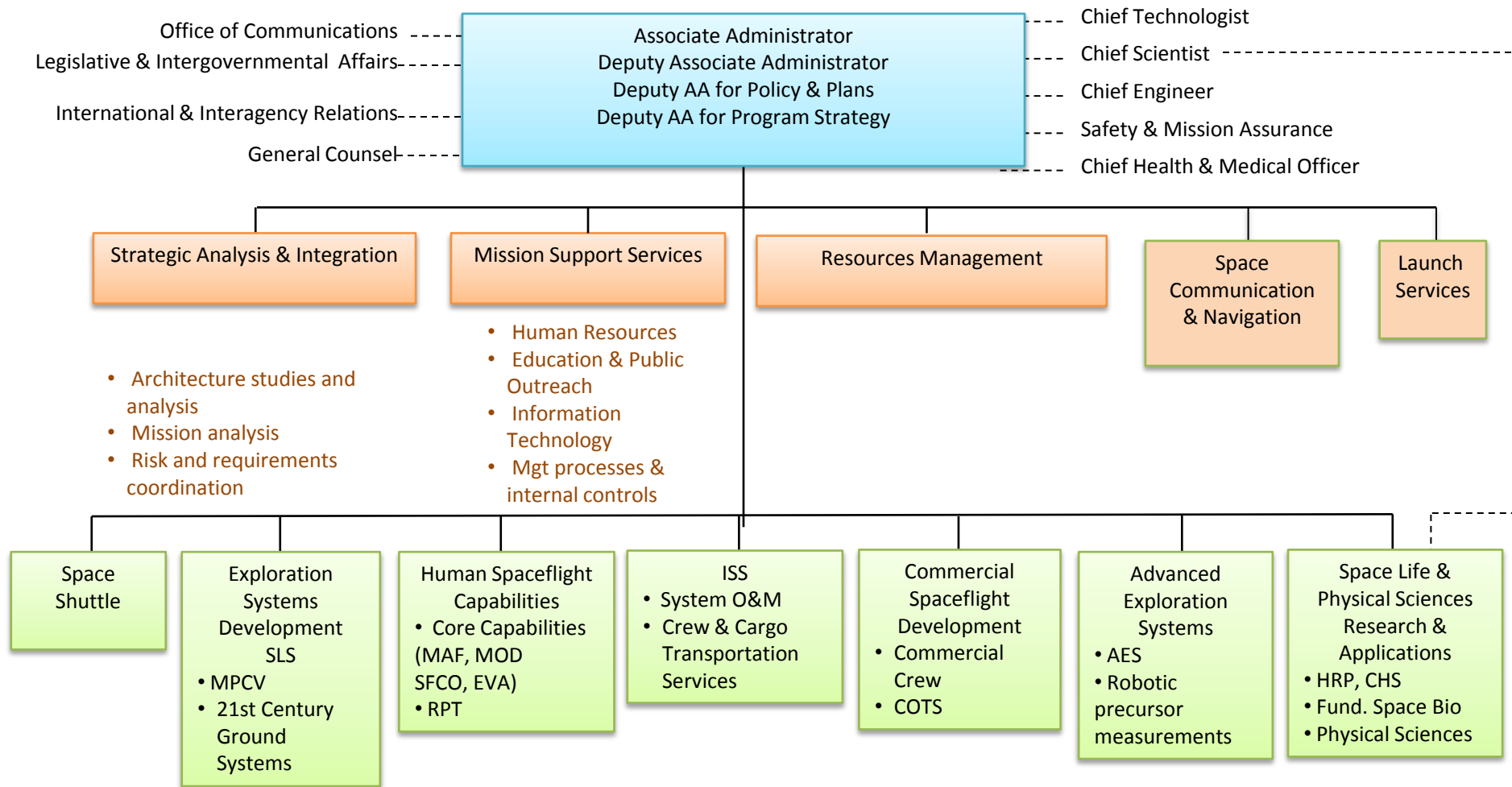


- ◆ **Task Group on Analysis Groups (TagAG) Final Report – Joint Meeting with NAC Science Committee –**
 - *Dr. T. Jens Feeley/NAC Science Committee*
- ◆ **Space Operations & Exploration Systems Mission Directorates Merger Update –**
 - *Ms. Lynn Cline/SOMD & Dr. Laurie Leshin, ESMD*
- ◆ **ISS Mars Analog Status Update –**
 - *Mr. Charlie Stegemoeller/Johnson Space Center*
- ◆ **COTS/CRS & Commercial Crew - Joint Meeting with NAC Commercial Space Committee**
 - *Mr. Michael T. Suffredini/JSC, Mr. Alan Lindenmoyer/JSC, Mr. Phil McAlister/ESMD*
- ◆ **Multipurpose Crew Vehicle/Space Launch System Update –**
 - *Mr. Dan Dumbacher/ESMD*



Proposed Human Exploration and Operations Mission Directorate

Organizational Structure:
Human Exploration and Operations Mission Directorate



Acronym Key:

AES = Advanced Exploration Systems
COTS = Commercial Orbital Transportation Services
MAF = Michoud Assembly Facility
MOD = Mission Operations Directorate
RPT = Rocket Propulsion Test
SLS = Space Launch System

CHS = Crew Health & Safety
EVA = Extravehicular Activity
MPCV = Multi-Purpose Crew Vehicle
O&M = Operations & Maintenance
SFCO = Space Flight Crew Operations

ISS Nat'l Lab Mgt.

Figure 1



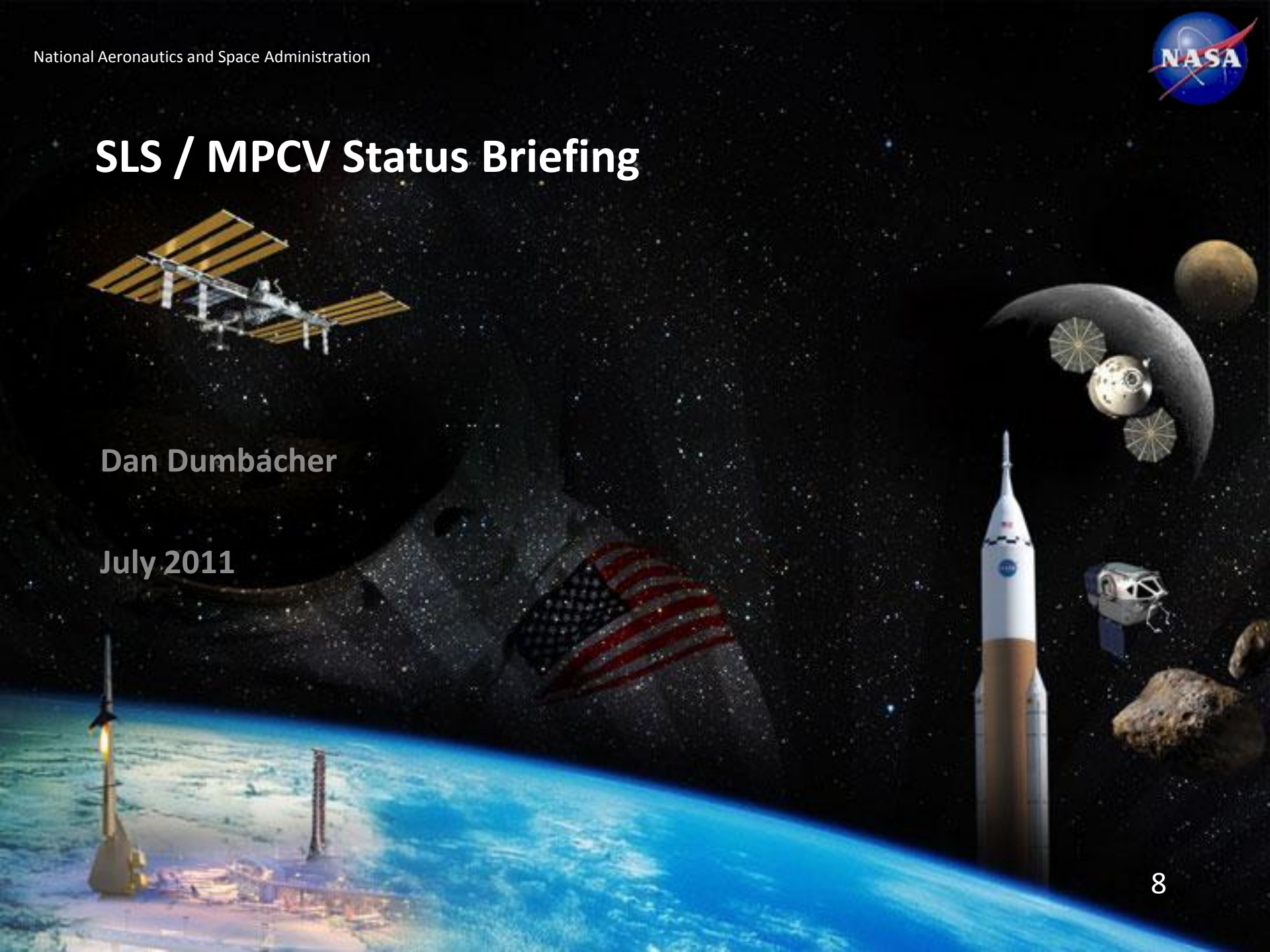
SLS/MPCV Status Briefing



SLS / MPCV Status Briefing

Dan Dumbacher

July 2011



Guidance Used to Develop MPCV and SLS Strategies



- **Current strategy for SLS/MPCV Based on architecture analysis and Authorization Act direction**
- **Key Auth Act direction**
 - For SLS
 - The Administrator shall, to the extent practicable, extend or modify existing vehicle development and associated contracts
 - The initial capability of the core elements, without an upper stage, of lifting payloads weighing between 70 tons and 100 tons into low-Earth orbit (LEO)
 - The capability to lift the multipurpose crew vehicle
 - The capability to serve as a backup system for supplying and supporting ISS cargo requirements or crew delivery requirements not otherwise met by available commercial or partner-supplied vehicles
 - For MPCV
 - The vehicle shall continue to advance development of the human safety features, designs, and systems in the Orion project
 - The capability to provide an alternative means of delivery of crew and cargo to the ISS, in the event other vehicles, whether commercial vehicles or partner-supplied vehicles, are unable to perform that function.



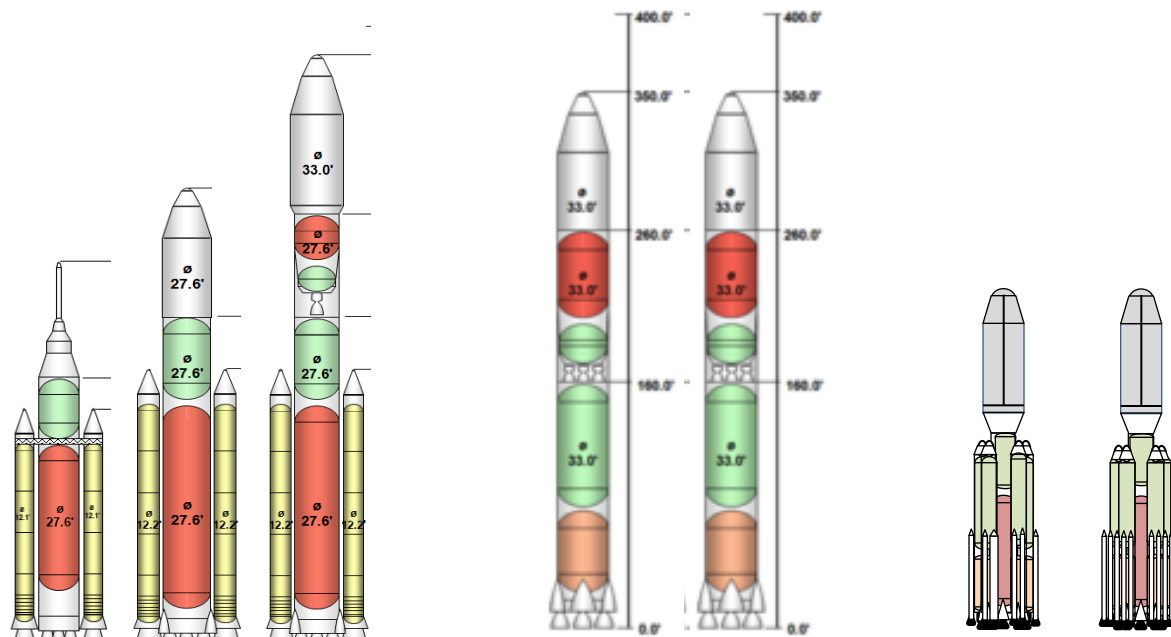
- **NASA will develop MPCV using the current Orion plan and contract**
 - Revisited architecture pertaining to MPCV requirements
 - Considered whether New Acquisition for MPCV would enable more optimized integrated SLS/MPCV plan
 - Considered potential for use of advanced technologies and changing approach to MPCV development in context of advances already integrated into Orion plan
 - In context of requirements in NASA Authorization Act of 2010, NASA determined that it was practicable and appropriate to develop MPCV using the current Orion plan and contract

Approach:

- Leverage three government Requirement Analysis Cycle (RAC) Teams to create and study different design concepts that leverage capability across American industry
- In parallel, solicit industry input and concepts via study contract input

Implementation:

- HEFT and FOM studies (Fall 2010) concluded without architecture decisions
- Government Requirements Analysis Cycle (RAC) – Kick-off Nov 4
 - Three competing configurations with fourth team looking at cross-cutting affordability
 - Approaches to affordability addressed by all 3 teams
 - Common requirements (from HEFT), goals/threshold approach - tradable
 - Incorporate incremental inputs from NASA Heavy Lift study contracts
 - Out brief to SLS Feb 16-18
- Contractor Heavy Lift Study Contracts—awarded November 2010
 - 13 Contractors, \$650K each, 6 month studies – broad SOW ideas
 - Initial Out briefs Feb 22-24
 - Final Out briefs Apr 25-28



	LOX/H ₂ – Reference Vehicle Design	LOX/RP	Modular
Description	Hydrogen core configuration with solid strap-on boosters; multiple evolution paths	Large RP configuration (large diameter tanks) with multiple engine options, incl. NASA/USAF common engine	Modular RP configuration (smaller diameter tanks) with multiple engine options, incl. NASA/USAF common engine
Lift Capability	70 mT – 150 mT	100 mT – 172 mT	70 mT – 130 mT

Note: Images based on government design solutions from RAC teams



- **Current Technical Path for SLS**
 - Exploration-class, heavy-lift launch vehicle initially capable of lifting 70-100 metric tonnes (mT) to LEO, while ultimately being evolvable to a lifting capacity of 130mT
 - Common use of liquid oxygen/liquid hydrogen propulsion for both the SLS core stage as well as the upper stage
 - Continue to evaluate the multitude of existing liquid oxygen/liquid hydrogen engines in the United States fleet that include the RS-25, RS-68, and J-2X
 - Still assessing best approach for strap-on boosters
 - Looking at feasibility of first uncrewed test flight of 70-100 mT configuration in late 2017 (based on funding levels from FY2012 budget request) followed by crewed flight in early 2020s
- **Evaluating procurement strategies; including competition options and scope and applicability of current contracts**
- **Assessing all trades against cost estimates, affordability measures, schedule estimates, and adherence to the NASA Authorization Act of 2010.**



No Recommendations